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QUARTERLY PROGRESS REPORT, OCTOBER 1-DECEMBER 31, 1968

Federal Water Pollution Control Administration
Corvallis, Oregon

January 1969

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QUARTERLY PROGRESS REPORT

PACIFIC NORTHWEST WATER LABORATORY CORVALLIS, OREGON

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OCTOBER 1–DECEMBER 31, 1968

FEDERAL WATER POLLUTION
CONTROL ADMINISTRATION
NORTHWEST REGION

CLEAN WATER

41

PACIFIC NORTHWEST WATER LABORATORY

QUARTERLY REPORT

October 1 through December 31, 1968

United States Department of the Interior
Federal Water Pollution Control Administration
Northwest Region, Corvallis, Oregon

January 1969

CONTENTS

	Page
NATIONAL COASTAL POLLUTION RESEARCH PROGRAM	1
NATIONAL EUTROPHICATION RESEARCH PROGRAM	6
Physiological Control Branch	6
Ecological Control Branch	7
WASTE TREATMENT RESEARCH & TECHNOLOGY PROGRAM	13
Paper and Allied Products Research Branch	13
Food Wastes Research Branch	15
Special Studies Branch	18
NATIONAL THERMAL POLLUTION RESEARCH PROGRAM	20
BIOLOGICAL EFFECTS RESEARCH PROGRAM	26
TRAINING AND MANPOWER DEVELOPMENT	30
CONSOLIDATED LABORATORY SERVICES PROGRAM	33
TECHNICAL ASSISTANCE AND INVESTIGATIONS	35
POLLUTION SURVEILLANCE	37

NATIONAL COASTAL POLLUTION RESEARCH PROGRAM - 9841/1607

General Information

A directive was received from the Commissioner to participate in all coastal studies of the Administration through consulting, technical assistance, project review, and coordination of research.

Status of Projects and Significant Accomplishments

Chemical Oceanography Branch

Detailed plans were initiated for tracer experiments to measure rates of atmospheric transfer on a small estuary; these will be applicable to oxygen and nitrogen transfer studies. Requests were made to the AEC for license to release tritium and radioactive tagged krypton to the environment as a part of these studies.

A G. K. Turner Astro D. B. Fluorometer is being calibrated preparatory to identification of the excitation and emission spectra needed for use in airborne remote sensor equipment. Initial interest is related to the quantitation of kraft mill effluents from airborne equipment especially when such effluents are mixed with salt water. Radar is also being considered for the remote sensing of such effluents.

Estuarine Diffusion of Pollutants Project

Work continues on a part-time basis on processing of Yaquina River field data collected in the estuary. The mathematical model obtained from the Alameda laboratory of FWPCA's Southwest Region is being extended to provide temperature prediction in the Columbia River Estuary.

A flow plan for the Columbia River temperature prediction model has been completed. This plan of the estuary is based on a 2 1/2 minute integration period in the explicit solution used. The procedure employed to lay out the estuary involves a good deal of mental averaging and integration and is thus subject to human error. To minimize this, a new method for determining stability prior to running the actual computer program is being examined. Local climatological data from Astoria, Oregon, were used as input to a program to compute radiation terms in the heat budget for July 1968. Data from Portland and Salem for the same period will also be processed in order to examine the effect of the location of meteorological reporting stations in the heat budget terms.

Coastal Distribution of Pollutants

Work continues and is now 70 percent complete on a state of the art report on ocean outfalls.

Biological Assessment of Marine Pollution

Data analysis continues on evaluation of macro-invertebrate substrate samplers and mid-water trawls. Trawling has now been terminated.

Grant and Contract Research

A contract was awarded to Seattle University to determine the oxygen uptake of bottom materials disturbed by dredging and other periodic disturbances.

Technical reviews of preproposals and proposals for research grants and contracts were provided on the following subjects: FWPCA code designation, when available, follows each title.

1. Small Particle Aspect of a Pollution - 10000 DFD
2. Ocean Disposal of Industrial Wastes - WPRD 274-01
3. Big Eddies and Mixing Processes in the Great Lakes WP 1139-01
4. The Problem of Thermal Pollution
5. Ocean Disposal of Thermal Wastes
6. Model of Dissolved Oxygen and Oxygen Demand Distribution for Salt-Marsh Bordered Estuaries - 10000 DPG
7. A Study to Evaluate Means of Calculating Reaeration Coefficients for Estuarine Systems -- Preproposal
8. Wind Effects on Dispersion and Mixing in the Galveston Bay Estuary -- Preproposal
9. Verification of the Two-Dimensional Dynamic Temperature Model -- Preproposal
10. Coliform Die-Away Study for the Galveston Bay System -- Preproposal
11. A Study to Evaluate the Application of Physical Hydraulic Models (Vicksburg) to Prediction of Water Quality Parameters -- Preproposal

Areas of Concern

Delays in negotiations for research contracts make it appear that we will not be able to meet the deadline for the National Estuarine Study

to include a report on the state of the art of estuarine modeling.

Reports and Papers

D. J. Baumgartner and W. A. Cawley. "Our Contaminated Coastal Waters", Oceanology International November/December 1968, pp. 39-41.

D. J. Baumgartner, "Discussion of a paper by Ralph Mitchell and J. Carrell Morris, entitled, 'The Fate of Intestinal Bacteria in the Sea'", Proceedings, Fourth Conference: International Association on Water Pollution Research, Prague, Czechoslovakia, 1968.

George R. Ditsworth, "Environmental Factors in Coastal and Estuarine Waters." Bibliographic Series - Volume 2, Coast of Washington.

Equipment

None acquired

Plans for 3rd Quarter, FY 1969

Chemical Oceanography Branch

Since areas of interest in chemical oceanography relate to sources of trace elements and trace organic compounds, and the interaction of such elements with a pollutant load, it is planned to investigate activation analysis and isotope dilution as analytical techniques available to the program. All the required equipment for this work is available for program use at the OSU Radiation Center.

Estuarine Diffusion of Pollutants Project

Development and testing of the temperature model for the Columbia

River will continue. A method for reading hydrographic chart depths directly to a keypunch operator will be studied as part of the input data preparation for the math model. It is anticipated that schematization of an estuary can be simplified, input data to the model can be automatically determined, and that stability can be predicted prior to machine execution of the hydraulic portion of the model. The feasibility of this method depends on being able to describe the geometry of irregular finite elements of the schematization closely enough to permit accurate determination of channel areas and junction volumes.

Comparisons of heat budget variation with location and season will continue.

NATIONAL EUTROPHICATION RESEARCH PROGRAM

9841/1601 and 9884/000

PHYSIOLOGICAL CONTROL BRANCH

Status of Projects and Significant Accomplishments

Physiology Section

Study has been initiated to determine the minimum and optimum nitrogen and phosphorus concentrations for growth of the green alga, Selenastrum capricornutum. Growth with both ammonium and nitrate as nitrogen sources is also being compared.

Algal Assay Procedures Section

The revised Provisional Algal Assay Procedures (PAAP) have been approved by the Joint Industry/Government Task Force on Eutrophication and are being prepared for publication.

A four-reactor unit for conducting continuous-flow algal assays has been fabricated and initial test runs completed. Certain modifications were indicated and are being completed. Two additional four-reactor units are under construction.

Grants have been awarded to the University of North Carolina, the University of California, Berkeley, and the University of Wisconsin to study and evaluate the continuous culture method as a means of assessing algal growth kinetics in different waters in comparison with the batch culture technique.

ECOLOGICAL CONTROL BRANCH

Status of Projects and Significant Accomplishments

Nutrient Control Section

A satisfactory modification of the University of Washington research grant to study the effects of flushing on Moses Lake was attained. It was agreed that they should apply for a no-cost extension of time through September, 1969, to permit evaluation of data and the writing of a final report. The project will be terminated at the end of September 1969.

At Detroit Lakes, background data were obtained on Lake Sallie by Dr. Joe Neel, and aquatic plant and sediment samples were sent to PNWL for analysis of P, N, C, H, and trace metals. Plants of sufficient length were separated into top, middle and lower fractions, and each fraction analyzed separately to determine chemical variations within a plant.

Laboratory studies have been initiated to study nutrient transport across a thermocline. Successful growth of phytoplankton in the "epilimnion" of a thermally stratified six-foot water column has been accomplished. Development of the experiment will continue. A 14-foot aluminum boat and outboard motor were purchased, initially for use on Klein's Pond, where destratification experimental work will be carried out beginning next quarter.

A program to determine nutrient contribution via precipitation is in progress, with rain and snow sampling being carried out in the

Corvallis area. Arrangements have been made to obtain snow samples from the Waldo Lake region in January 1969. Analyses of collected snow and rainwater are being carried out by Consolidated Laboratories. Development of Waldo Lake by the U. S. Forest Service for recreational purposes has led to planning a monitoring program by NERP to begin in the spring. This highly oligotrophic lake will be watched for signs of enrichment. Cooperation with Oregon State University is being discussed.

Sediment-Water Interchange Section

Sediment cores were obtained from Upper Klamath Lake in cooperation with the U. S. Bureau of Reclamation. Sediment samples were obtained from the Salton Sea, Lake Sallie, and Shagawa Lake for analysis and comparison with Upper Klamath Lake sediments.

Laboratory experiments to determine effect of sediments on growth of algae in overlying water have been carried out, as well as experiments on the prevention of sediment-water interchange of phosphorus. Those experiments on the prevention of sediment-water interchange of P by chemical precipitation reactions indicate that rare earth metal ions (didymium) retard Selenastrum growth in Upper Klamath Lake water exposed to sediment with or without mixing. Zirconium retards initial growth, but aluminum and calcium did not visibly retard the algal growth under the conditions of the experiment. These results will be further verified by experiments in aquariums.

Selenastrum grows better in lake water in contact with Upper Klamath Lake sediments than without contact with sediments. This has been verified with sediments containing both low and high soluble ortho phosphate and ammonia in the sediment interstitial water. It is now proposed to carry out an identical experiment with sediment from an oligotrophic lake. These experiments have been conducted in both aquariums and beaker-size equipment.

Interchange experiments in large glass columns with sediment low in soluble nutrient content in the interstitial water indicate that exchange of phosphorus and nitrogen occurs under both aerobic and anaerobic conditions. The persistence of high concentrations of nitrite in the overlying water indicates that the lake conditions are not simulated. The experiments should be carried out at lower temperature, and probably in the presence of algal growth and radiation.

Surprisingly high concentrations of soluble ortho phosphate (0.15 to 1 mg P/ℓ) and ammonia (3.5 to 16 mg N/ℓ) were found to be present in interstitial water from sediments from Salton Sea, Shagawa, and Sallie Lakes.

Biological Control Section

No activity.

Shagawa Lake Project

Field experiments initiated in September were terminated during the first two weeks of October, and securing of weather-vulnerable equipment

was begun October 15. The pilot plant was shut down during October and November for maintenance, and to permit use of operators for other priority work. Efforts since October have been directed toward completion of chemical analyses, data work-up, and repair and maintenance of the pilot plant and pumping station. Sampling on Shagawa Lake has been curtailed by unsafe ice.

As a result of experiments conducted in the test basins during the summer, it appears as though the lake has very low response to growth of blue-green algae after September 15; this is possibly a temperature effect. It is further indicated that the flow rate of 65 GPM represents insufficient residence time of lake water-effluent mixtures in the test basins, and that appreciably lower flow rates will be more successful in demonstrating differences in algal growth among the three basins.

A cooperative project with Cincinnati on freezing of alum sludge was begun in December.

Grant and Contract Research

Technical reviews of preproposals and proposals for research grants, demonstration grants, and contracts were provided on the following subjects:

1. Provisional Algal Assay Procedures.
2. Factors Affecting the Structure of Diatom Communities.
3. Feasibility Study Involving the Use of Bark Derivatives as Phosphate Adsorbents.

4. Demonstration Project on Eutrophication of Surface Waters.

5. Algal Production in Eutrophic Mountain Reservoirs.

6. The Biology and Response of Corixidae to Eutrophication.

7. Phosphate Retention by Lake Sediments.

8. Deposit-Water Interchange of Plant Nutrients in Lakes.

9. Water Quality and the Character of New England Clays.

10. Reclamation of Lakes by Removal of Phosphorus-Containing Algae.

11. Eutrophication Factors in North Central Florida Lakes.

12. Eutrophication of New River, Broward County, Florida.

13. Proposal for Removing Algae Nutrients from Lakes.

Areas of Concern

Several questions remain to be resolved regarding Detroit Lakes. It must be decided whether weed harvesting will begin during 1969, and a decision is needed as to when Soil Conservation Service may begin experimental spray irrigation with secondary effluent from Detroit Lakes.

It has not yet been possible to begin the PAAP tests on Shagawa Lake pilot plant effluent mixtures which hopefully will guide the design of experiments in the test basins next summer. Difficulties in obtaining equipment and shortages in personnel are responsible for the delay.

Personnel shortages are probably the most serious problem confronting the entire program. The addition of several positions at the lower

GS levels would expedite existing projects enormously and permit more necessary time for planning and coordination by supervisory personnel.

Plans for 3rd Quarter FY 1969

Present programs in Nutrient Control and Sediment-Water Interchange will continue. Field work on Upper Klamath Lake will be restricted, but some sampling of water and sediment through the ice will be done. Acquisition of background data on Klein's Pond, prior to experimental manipulation, will begin in January. The precipitation study will be expanded to include snow samples from the Cascades and possibly Mary's Peak. Shagawa Lake personnel will be concerned principally with sample analysis, data work-up, and preparations for the coming field year.

WASTE TREATMENT RESEARCH & TECHNOLOGY PROGRAM

9841/1204, 1206, 1210, 1301

The Waste Treatment Research & Technology Program includes activities under four separate PPB codes assigned to this laboratory and carried out by three branches of this program. Paper and Allied Products Research is funded out of PPB Code 1204.

Food wastes research is conducted by personnel in the Food Wastes Research Branch under responsibility delegated through PPB 1206 even though no positions or funds are currently assigned to this activity. Those research activities conducted by this program are staffed by personnel temporarily borrowed from Technical Programs.

Research activities under PPB Code 1210, Wood Products, and 1301, Forestry and Logging, are likewise supported by personnel borrowed from Technical Programs and no positions or research funds are available.

PAPER AND ALLIED PRODUCTS RESEARCH BRANCH - 9841/1204

Status of Projects and Significant Accomplishments

Polymers in Waste Treatment

Screening of numerous polymers to determine their effect on the separation of suspended solids in wastes has been completed; pilot plant studies were started to demonstrate practicability of those polymers found useful in the screening tests.

Research Needs in the Pulp and Paper Industry

A listing of research needs compiled by the American Paper Industry has been completed and is currently being categorized.

Grant and Contract Research

The following active demonstration grant projects are monitored through project office assignments to the Corvallis laboratory:

1. Pulp Manufacturers Research League, Appleton, Wisconsin, WPRD 12-01-68.
2. Beet Sugar Development Foundation, Longmont, Colorado, WPRD 43-01-67.
3. Mead Corporation, Chillicothe, Ohio, WPRD 55-01-67.
4. Crown-Zellerbach Corporation, Lebanon, Oregon, WPRD 69-01-68.
5. Robertson Pulp and Paper Laboratory, Raleigh, North Carolina, WPRD 115-01-68.
6. Georgia Kraft Company, Macon, Georgia, WPRD 116-01-68.
7. Georgia Kraft Company, Rome, Georgia, WPRD 117-01-68.
8. Crown-Zellerbach Corporation, Camas, Washington, WPRD 144-01-68.

The following active research grant project is monitored through project officer assignment to the Corvallis laboratory:

University of Washington, Joseph L. McCarthy, 12040 DEH, "Studies of Low Molecular Weight Lignin Sulfonates."

Areas of Concern

Budget and manpower restrictions continued to prohibit the initiation of meaningful in-house projects.

Plans for 3rd Quarter, FY 1969

Because of budget restrictions, most of the available staff time will be occupied with the monitoring of grants. Work will continue on the sorting of research needs and priority determinations and participation will begin in the Crown-Zellerbach, Lebanon, Oregon demonstration grant project.

FOOD WASTES RESEARCH BRANCH - 9841/1206

Status of Projects and Significant Accomplishments

The cooperative two year pilot plant study with J. R. Simplot Company, Burley, Idaho on the secondary treatment of potato processing wastes was terminated July 1, 1968. Data analysis of this study has been completed and a draft of the final report is being reviewed internally prior to revision and submission to the Regional Office for clearance.

A two-day meeting with the National Canners Association's (NCA) Technical Committee on Waste Research was attended at NCA's laboratories in Berkeley, California. A summary of FWPCA's in-house activities and grant program in the Food Wastes Research Branch was presented. NCA's ongoing and proposed projects were discussed in detail.

A one-day meeting with industrial sponsors and staff of North Star R&D Institute was attended in Minneapolis, Minnesota, to discuss progress and current status of grant number WPRD 49-01-68, "Use of Fungi Imperfecti in Waste Control." Dr. W. B. Cooke, Cincinnati Water Research Laboratory, is FWPCA's assigned project officer.

Onsite visits were made to the following grantees: Snokist Growers, R. T. French Company, and Dallas,Oregon to discuss current status of projects.

No in-house activities were initiated during the quarter.

Grant and Contract Research

Current demonstration grant projects for which the branch chief has been assigned as project officer include:

1. Snokist Growers, Yakima, Washington, WPRD 58-01-68. The project is nearing its second and last year of operation. Data analyses for the final report will be started during the next quarter.

2. R. T. French Company, Shelley, Idaho, WPRD 15-01-68. The construction contract was awarded in November and some excavation was completed.

3. Dallas, Oregon, WPRD 29-01-68. Most of the earthwork, concrete work, and plant piping has been completed. Nearly all work onsite has been terminated until early spring due to current rainy season.

4. University of Washington, Seattle, Washington, WP 01486. Work is continuing on the State-of-the-Art paper on potato processing wastes which is scheduled for completion May 31, 1969.

The following subjects of proposals and preproposals for grants were reviewed during the quarter:

1. Aerated Storage and Off-Peak Pumping of Dairy Wastes Cooperative.

2. Anaerobic Fermentation-Aerobic Stabilization Process for Treating Waste Whey with Domestic Sewage.

3. Demonstration of an Improved Method of Sludge Disposal from Joint Treatment Facilities of a Small City.

4. Development of Economical Solutions for Problems Resulting from Conditions Imposed on Discharging Blue Cheese Plant Waste into a Small Municipal Sewerage System.

5. Acid Whey Utilization and Disposal.

6. State-of-the-Art, Sugarbeet Processing Waste Treatment.

7. Dynamic Process Development for Biological Treatment of Whey Bearing Wastes.

Areas of Concern

Lack of personnel assignment to PPB 1206.

Plans for 3rd Quarter - FY 1969

Complete final report on secondary treatment of potato processing wastes. Continue assistance to Potato Processors of Idaho Association.

Continue project officer responsibilities on assigned grants and visit other grantees in food waste treatment.

Increase efforts aimed at generating applications for grants on joint, as well as industrial waste treatment, plus state-of-the-Art papers.

SPECIAL STUDIES BRANCH - 9841/1210, 1301

Status of Projects and Significant Accomplishments

Forestry and Logging (1301)

A second draft has been prepared of the project plan for the preparation of an industrial waste guide for logging operations to minimize water quality degradation. This project will be staffed by personnel borrowed from the Northwest Regional Office.

Wood Products (1210)

The final report on the Plywood Plant Glue Waste Study, Technical Projects, has been submitted for publication. This study demonstrates the feasibility of biological treatment of interior plywood glues and outlines suggestions for significant reductions in waste volumes through in-plant changes.

Laboratory pilot plant studies on aerobic and anaerobic treatment of urea glue and steam vat condensate were continued during the quarter. These studies are to provide supporting information to research grant WPRD-174.

Grant and Contract Research

In-plant changes have been completed to reduce waste strength and volume,and design is underway on facilities for waste treatment in connection with demonstration grant WPRD-174, Klamath Plywood Corporation.

Areas of Concern

No funds or positions are currently assigned to the research activities concerned with forest industries and the only efforts possible are those conducted with borrowed personnel.

Reports and Papers

The final report of the Plywood Glue Waste Study has been completed and submitted for publication.

Plans for 3rd Quarter, FY 1969

Work will get underway during the quarter on two technical projects related to forest industries research; namely, the Industrial Waste Guide for the Logging Industry and the Log Storage and Handling Project.

NATIONAL THERMAL POLLUTION RESEARCH PROGRAM - 9841/1613

Status of Projects and Significant Accomplishments

Columbia River Study Project

See section on Biological Effects Research Program, page 26, this report.

Technology Transfer

The "Industrial Waste Guide on Thermal Pollution" was published and initial distribution made.

A Technical Seminar on Thermal Pollution was held November 25-26, 1968, at the Pacific Northwest Water Laboratory. This seminar (workshop), directed primarily to the engineer working at the desk who has to come up with facts on which decisions are made, was attended by a broad spectrum of representatives of State agencies and other Federal agencies as well as FWPCA personnel.

We have been advised that the preparation of the state-of-the-art document on thermal pollution by Vanderbilt University has been delayed. The projected data for receipt of manuscript is now March 1, 1969.

Publication of the proceedings of the two Thermal Pollution Symposia is expected sometime in the next few months.

Effects on Water Uses Other than Fish

Discussions have been held with engineering representatives of the Eugene Water and Electric Board and their contractor, the Vitro Corporation,

relative to a demonstration project that would utilize warm water for irrigation. Mr. Alden Christianson has been designated project officer in the design of this proposal. The Eugene Water and Electric Board, several power companies of the Northwest, the State pollution control agency, and the Agriculture Department at Oregon State University will be involved in this study.

Predictive Techniques

Detailed work plans have been developed for intermural research to begin this spring on the subject of evaporation rates and the refining of techniques for predicting various terms of the energy budget.

Techniques for Biologic "Base Line" in Heat Discharge Site Evaluation

Dr. Ronald Garton has conferred with senior biologists of FWPCA on this matter and a report is in preparation.

Design and Efficiency of Cooling Towers

A model has been developed for predicting natural draft cooling tower performance and efficiency as related to local meteorologic and other independent variables. The first draft of the working paper has been prepared. The synoptic report from Dr. Fred Decker, Associate Professor, Physics, Oregon State University, on "Local Climatic Effects of Cooling Towers," was scheduled for delivery in November; the report has not yet been received but its delivery has been promised for early in the third quarter.

Technical negotiations were completed with E. Bollay, Inc., for contract on the "Theoretical Evaluation and Development of a Criteria to Determine Inadvertent Weather Modification in the Vicinity of Cooling Towers." The contract is being negotiated at Headquarters.

River Basin Planning for Thermal Pollution Control

No action this quarter.

General

Program Chief presented a paper titled, "Research in Thermal Pollution Control," at the Fourth American Water Resources Conference, New York, New York, November 18, 1968.

The Program Chief conferred with the Regional Director and other staff of the Great Lakes Region on Regional research needs for thermal pollution control. While in Chicago, he also met with representatives of the Argonne National Laboratory concerning cooperative research with AEC. It is hoped that Argonne can be encouraged to develop physical models of one or more proposed power plant sites on the Great Lakes that can be used to test some of the theory being developed on transport and behavior of heated discharges to large bodies of water.

Stimulated by the power industry, the staff has made a preliminary study of methods for reducing the evaporative fraction in the cooling process. Although the percentage of circulated water loss through evaporation is relatively small, its volume can reach significant proportions because of the tremendous volumes circulated. Evaporated

water may be significant to potential meteorologic hazards and to the overall water supply in water-short areas. Liaison has been established with the power industry for continuing investigations.

Grants and Contracts

A research contract was awarded the Dynatech Corporation for "A Technical Survey and Economic Analysis of Alternate Methods for Cooling Condenser Discharge Water in Nuclear Power Plants."

Reviews of applications for research grants were made on the following subjects:

1. Heat and Water Vapor Exchange Between Water Surface and Atmosphere.
2. Thermal Stratification and Reservoir Water Quality (Continuation).
3. A Proposed Study of the Effects of Heated Discharges in the Great Lakes.
4. Thermal Pollution and Surface Water Temperature.
5. Effects of Thermal Stress on the Food-Web Structure and Metabolism of Warm Water Communities. (Preliminary proposal)
6. Growth of Cladophora in Lake Michigan. (Preliminary proposal)
7. Thermal and Industrial Pollution: Delaware River. (Renewal)
8. Thermogravitational Thermal Diffusion in Liquids.

9. Ecological Mitigation of Marine Thermal Discharges.

10. Biologically Allowable Thermal Pollution Limits.

11. Warm Water Irrigation Proposal.

Reviews of proposal or scope of work for contract research were made on the following subjects:

1. Theoretical Evaluation and Development of a Criteria to Determine Inadvertent Weather Modification in the Vicinity of Cooling Towers.

2. Verification of the Two-Dimensional Temperature Model.

3. Research on the Physical Aspects of Thermal Pollution.

4. Feasibility Study of Nonthermal Pollution Power Generating Stations.

Areas of Concern

The need for better technology to predict thermal behavior in the "mixing zone" of a water body remains the top priority research need.

Discussion with Regional Directors and power industry representatives are pointing up the importance of the coastal areas in the United States, and the need for priority research therein. It appears that the coast is going to be the preferred location for many new power plants. Research on both the engineering aspects of heat transport and behavior and the biologic effects should be given high priority.

Reports and Papers

"Industrial Waste Guide on Thermal Pollution," published September 1968. Released for distribution January 10, 1969.

"Research in Thermal Pollution Control," Frank H. Rainwater, Chief, National Thermal Pollution Research Program, presented at the Fourth American Water Resources Conference, New York, New York, November 18, 1969.

Equipment

No major purchases.

Plans for 3rd Quarter, FY 1969

1. Conduct Technical Seminars (workshops) on Thermal Pollution Control at Ada, Oklahoma; Athens, Georgia; Cincinnati, Ohio; Metuchen, New Jersey, and Charlottesville, Virginia.

2. Distribute (within FWPCA) preliminary report on cooling towers.

3. Review, publish and distribute report on "Local Climatic Effects of Cooling Towers."

4. Review State of the Art document leading to publication in the 4th quarter.

BIOLOGICAL EFFECTS RESEARCH PROGRAM

Status of Projects and Significant Accomplishments

Thermal Pollution Studies

The facility at Bonneville for the simulation of adult salmon migration through elevated temperatures was winterized and the electronic equipment has been stored at Corvallis. No further activity is planned until spring, when and if spring chinook become available.

In the tissue enzyme study arrangements have been completed for acquiring juvenile sockeye, steelhead, coho and chinook from regional hatcheries. Preliminary enzyme assays have been completed for coho on: (1) α-hydroxybutryic dehydrogenase; (2) isocitric dehydrogenase; (3) lactic dehydrogenase; (4) phosphohexose isomerase; (5) transaminase (GO and GP); and (6) leucine amino naphthylamidase. Assays on five additional enzymes were attempted, but these will require further adaptation to achieve reliable results.

Until corrected, adverse water quality in the laboratory has forced the delay of further experiments. Accordingly, a system for recycling waste water was designed and requires only 2 L/min of supplemental water per 200-gallon tank. This is being tested regarding its ability to enhance and to maintain acceptable water quality. Present indications are very favorable.

Adverse Properties of Sulfite Waste Liquor

Coho salmon eggs from 15 mating pairs were spawned individually in 17 different concentrations of (stored) SWL. Approximately 51,000 eggs were tested using about 200 eggs per test lot. Basic physiological data were collected regarding salmon semen and ovarian fluid. After the eggs reached eyed stage, fertilization success was inversely proportional to the SWL concentration with some mating pairs and no effect was observed with other matirg pairs.

Artificial redds were constructed in two artificial streams; the experimental section received 50 ppm SWL. Coho eggs and standpipes were placed in the redd to determine subsequent hatching success and changes in water velocity or quality due to SWL. At present the eggs have incubated 55 days and the intra-gravel water velocity has decreased from 800 to 200 cm/hr in the experimental section due to slime growth. Possibly much of this work has been invalidated by adverse water quality that caused a fish-kill within the laboratory.

Fish-Kill Investigations

A fish-kill occurred within this laboratory and killed the entire stock of rainbow trout and all newly hatched coho sac-fry (about 30,000). Chemical analyses have not revealed the cause of the kill but appropriate action is being taken to determine the cause of the problem and correct it.

Areas of Concern

As before, the water supply for fish tanks is woefully inadequate in quality. This has already negated, in part, a research investment of about $5,000 and has delayed the study an additional year. Additionally, it is seriously delaying the Tissue Enzyme Study.

The only solution to the above problems is the construction of the proposed Biological Effects Laboratory. As yet, no construction money has been allocated for this purpose.

Reports and Papers

The Program Chief presented a paper entitled "Preliminary Studies of the Effects of Sulfite Waste Liquor on the Early Life Stages of Pacific Salmon: Fertilization Through Hatching" at the annual meeting of the Oregon Chapter of the American Fisheries Society.

Equipment and Facilities

Planning phases are progressing rapidly for the Biological Effects Laboratory. The building layout has been completed and awaits the next building conference.

Plans for 3rd Quarter, FY 1969

1. The Bonneville facility will be reactivated late in March and tested before use in the adult salmon studies.

2. Efforts will be continued to resolve the water quality problems in the wet lab.

3. Assuming the above efforts are successful, *in vitro* studies will be completed to determine denaturation temperatures for selected enzymes in sockeye, steelhead, coho and chinook; steelhead eggs will be spawned and incubated in SWL.

TRAINING AND MANPOWER DEVELOPMENT - 9825/000

Status of Projects and Significant Accomplishments

Direct Training

The training course, "Basic Principles of Wastewater Treatment", was presented for 24 trainees November 4-8, 1968. "Current Practices in Water Microbiology" was cancelled due to lack of adequate enrollment.

The planning and writing of the "Design and Management of Sewage Treatment for Small Federal Installations" manual was completed and forwarded to Cincinnati for production. Pre-enrollment for the course having the same title as the manual was so great that the course has been scheduled twice at the Corvallis Laboratory and once in Anchorage, Alaska.

Announcements have been distributed for the "Nutrient Removal and Advanced Waste Treatment" seminar which will be held at the Lloyd Center, Portland, Oregon on February 5-6, 1969. Pre-enrollment indicates excellent attendance.

Cooperative Area Manpower Planning System (CAMPS)

Governor McCall of Oregon reorganized the State Cooperative Area Manpower Planning System Committee with the title "The Governor's Manpower Coordinating Committee." Lyman Nielson was appointed by the Governor as a member of this committee.

An institutional-type training program for sewage treatment plant operators is being developed at Linn-Benton Community College with the

target date of April 1 to begin instruction. Initial contacts with the State of Idaho have been made relating to possible use of on-the-job training for the training of operators in that state.

General

Approximately 67 people were given tours of the Laboratory and an orientation to the role of the FWPCA in water pollution control. Orientation, films and slides were presented for 100 teachers at an in-service training meeting in Salem, Oregon. A water pollution control film was loaned to various groups and shown to approximately 200 viewers. A continuous showing of a film on water pollution control was provided at an Open House for approximately 273 guests.

The Training Branch provided assistance with arrangements for the Thermal Pollution Seminar in November. More than one hundred visual aids were made for use in this seminar.

Equipment

Diazo process equipment was purchased for use in making overhead transparent visual aids.

Plans for 3rd Quarter FY 1969

Training courses are planned as follows:

Design and Management of Sewage Treatment for Small

Federal Installations		Jan 5-10, 1969
"	" (Alaska)	Jan 20-24
"	" (Alaska)	Feb 10-14

Nutrient Removal and Advanced Waste
Treatment - Seminar, Portland, Oregon Feb 5-6

Chemical Analyses for Water Quality,
Corvallis, Oregon Mar 10-21

CONSOLIDATED LABORATORY SERVICES PROGRAM

Status of Projects and Significant Accomplishments

The laboratory continued to reduce its analytical backlog; from September 30 to December 31 it was reduced from 900 to 381 analyses.

An analytical Quality Control Program for automated silica determinations has indicated deterioration of a commercial silica standard.

The ammonia nitrogen analyses using the Technicon are now being run at two levels with two colorimeters. The range of ammonia values can be handled from 0.01 mg/l to 200 mg/l. Samples have been handled with ammonia concentrations of less than 0.01 mg/l to 145 mg/l without resorting to dilution.

Oxygen uptake studies are being made on dredge sludges. An E.I.L. probe with recorder is used to monitor uptake.

Areas of Concern

Kjeldahl digestion equipment is still awaiting assembly because of missing parts.

Reports and Papers

Rough draft of PNWL Analytical Methods Manual has been completed.

Equipment

The Turner Model 210 Spectrofluorometer and Recording Ratio spectrophotometer has been delivered and the equipment is operational.

Plans for 3rd Quarter, FY 1969

Work to be continued on analytical quality control program. Kjeldahl nitrogen and total phosphorus analysis with Technicon digestion unit will be attempted. Determination of cyanide by fluorometric techniques will be evaluated.

TECHNICAL ASSISTANCE AND INVESTIGATIONS - 9818A/000

Status of Projects and Significant Accomplishments

Flathead Lake Study

The final report is being reviewed for publication.

Middle Snake River Study

A third field survey was completed in which samples from 25 stations were analyzed for DO and temperature. Data from three field surveys is being compiled. Additional survey work is contemplated for the late summer of 1969.

Columbia River Thermal Effects Study

Manpower assistance complete. Project is under supervision of the National Thermal Pollution Research Program.

Dredging Study

Laboratory assistance started September 1968 is now complete. Project is supervised by TA&I, Northwest Region.

Kraft Mill Ocean Outfall Survey

Technical assist is being rendered for this study. Project is being supervised by TA&I, Northwest Region.

Treatment Plant Operational Data Survey

A review of plant & State operational data was made for a repre-

sentative number of plants in the States of Oregon, Washington and Idaho. A report of this survey is now being prepared.

National Estuarine Study

Project under supervision of TA&I, Northwest Region. Collected and assembled data for industrial and municipal waste discharges into Coos, Yaquina, Tillamook, and Young's Bays; The Columbia River from the mouth to Bonneville; and the Willamette River from the mouth to Oregon City. Project was started and completed during the quarter.

Plans for 3rd Quarter, FY 1969

A survey of two Kraft Mill ocean outfalls will be made for the State of Oregon. A bacteriological study of municipal waste outfalls in Puget Sound may be started.

POLLUTION SURVEILLANCE - 9822/000

Status of Projects and Significant Accomplishments

Sampling at all Regional surveillance stations continues with additional locations and/or analyses included at the request of other FWPCA or State programs to the extent possible. Meetings were held with all FWPCA units in the Region to determine their needs for water quality data. Subsequently a meeting was held with the USGS Districts in the Region to become familiar with their data collection programs and to begin talking of coordination of USGS/FWPCA data collection activities. State program officials were contacted and plans for Federal/State coordination of data collection were discussed.

A seminar was held to inform all potential STORET users in the Region of the modifications and increased capability of STORET. At that time a demonstration of the "terminal model 1978" in the Regional office was demonstrated.

A program for flagging water quality standards violations was developed for use with the SHAVES system and presented to Regulatory Branch personnel for review.

Seventeen new surveillance stations were added at the request of the Basin Planning Activity to provide data for appraisal of proposed water regulation projects.

Water Pollution Surveillance System stations previously operated by cooperating volunteers have been absorbed into the Regional Surveillance

program and are now operated entirely by FWPCA personnel. Printouts of surveillance data are provided to all concerned agencies on a quarterly basis.

The Inventory of Municipal Waste Facilities was reviewed to assure accuracy prior to final printing.

Reports and Papers

A "working paper" on the use of plankton as a pollution surveillance parameter has been drafted and final revisions are presently being made. The report will be available for limited distribution in the spring of 1969.

Equipment

No new equipment.

Plans for 3rd Quarter, FY 1969

Routine sampling will continue at all surveillance stations.

As time and manpower permit specific field studies will be conducted to provide information required in order to recommend corrective action at below-standard locations.